MEMORANDUM ON VACCINATION AGAINST SMALLPOX

Memo 312/MED, Revised 1972
(Issued November 1972)

CORRECTION

Footnote, page 9: first paragraph, fourth line:

Delete seven days and insert fourteen days. Add the following sentence: If the vaccine is stored at ambient temperatures after removal from deep freeze, its potency cannot be assured for more than seven days.

Department of Health & Social Security
July 1973

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DEPARTMENT OF HEALTH AND SOCIAL SECURITY

Memorandum on Vaccination Against Smallpox

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PREFACE

Since the previous (1967) edition of the Memorandum on Vaccination against Smallpox was published the Joint Committee on Vaccination and Immunisation have advised that routine vaccination and re-vaccination during childhood should no longer be recommended.

It is stressed that whereas the probability of importation of smallpox into this country has been greatly reduced, the possibility of such importation will remain until smallpox is completely eradicated from the world. For this reason health service workers and certain travellers must continue to be protected by smallpox vaccination.

Among the other principal changes in this edition are:

(*a*) Listing of the categories of individuals who should now be vaccinated against smallpox.

(*b*) inclusion of lymphoma and other reticulo-endothelial malignancies in the list of contra-indications to vaccination.

(*c*) new recommended storage conditions for smallpox vaccine.

(*d*) revised advice concerning the simultaneous administration of smallpox and yellow fever vaccines.

G. E. Godber

Chief Medical Officer.

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MEMORANDUM ON VACCINATION AGAINST SMALLPOX

1. The progress of the World Health Organisation's smallpox eradication programme, which was intensified in 1966, has led to a substantial reduction in smallpox throughout the world, both in the number of cases reported and in the number of countries where smallpox still occurs. This has resulted in a greatly reduced risk of importation of smallpox into this country and, accordingly, in July 1971 the Joint Committee on Vaccination and Immunisation advised that vaccination and revaccination should no longer be recommended as a routine during childhood.

2. The Joint Committee also stated that vaccination or re-vaccination against smallpox would still be required in certain circumstances:

(a) contacts of cases or suspected cases of smallpox,

(b) persons, including children, who travel to areas where smallpox still occurs or where eradication programmes are in progress,

(c) health service workers who may come into contact with patients with smallpox, or infected materials from such patients.

3. In this memorandum the practical aspects of vaccination techniques have first been set out and then their application to various vaccination procedures i.e.

(a) primary vaccination in early childbood, and at later ages,

(b) re-vaccination,

(c) vaccination in the presence of smallpox,

(d) vaccination in relation to other immunising procedures.

Notes are also included on inspection and recording of results.

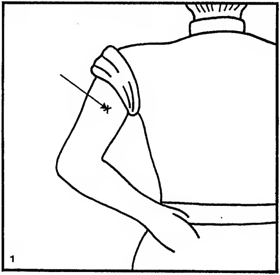

Fig. I.

4. *Site of Insertion.* It is generally agreed that vaccination, especially of infants, is best done on the arm. The site of election is at the junction of the upper and middle thirds of the humerus behind the midline. (See Fig. I). Here scarring will be less noticeable and the lesion is protected naturally from trauma. Vaccination on the leg tends to lead to severe local and general reactions so that choice of this site entirely for aesthetic reasons is unwise.

5. *Preparation of the skin.* Chemical agents, such as ether, acetone or spirit, need not be used. If the skin is dirty it should be cleansed gently with plain soap and water and wiped dry. Vigorous rubbing is inadvisable.

6. *Application of vaccine.* Liquid smallpox vaccine is now usually supplied in plastic tubing. The vaccine can be expressed after snipping the tubing with scissors and applied with a needle by one of the two methods described below. Alternatively it may be more convenient to pierce one end of the tube with a sterile, disposable, hypodermic needle, which can also be used for applying the vaccine.

If scissors are used it is inevitable that they will become contaminated and appropriate precautions are necessary. It may be wise to keep a special pair of scissors solely for this purpose. After use, the scissors should preferably be boiled or else wiped with a swab thoroughly soaked in surgical spirit. Alcohol should not be allowed to come into contact with the vaccine before or during the vaccination procedure.

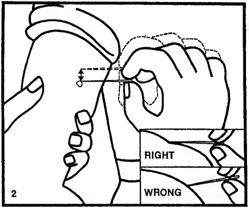

Fig II The "multiple pressure" method of vaccination, showing the rapid up and down motion of the side of the needle, held by the hand at the right, against the drop of vaccine on the arm at the left.

7. *Method of vaccination.* The multiple pressure technique and the scratch technique are both satisfactory. The multiple pressure technique is normally to be preferred since this method is less likely to cause unnecessary trauma to the skin. When, however, a number of persons are to be vaccinated, the scratch technique has the advantage that it is less time-consuming.

8. *Multiple pressure technique.* For this method a straight needle, flat sided or triangular in section (e.g. a Hagedorn or disposable syringe needle) is required. It should be large, sharp and sterile. It is held parallel or tangential to the arm. One side of the needle point is pressed firmly and rapidly into the drop of vaccine the requisite number of times (see paras. 14, 17 and 19) within an area of skin not more than one eighth of an inch in diameter, the needle being lifted clear of the skin each time. The rapid up and down motion of the needle is in a plane perpendicular to the skin surface (see Fig. II). The needle point is not driven into the skin but at each pressure the elasticity of the skin pulls a little of the epidermis over the point of the needle (see Fig. III), so that the vaccine is carried into but not below the deeper epidermal layers. If the skin has not been unduly irritated during preparation and the needle has been properly aligned no pain or bleeding should occur. As soon as the pressures have been completed the excess vaccine lymph should be gently wiped away with sterile, (not antiseptic), gauze or cotton wool and the remainder allowed to dry.

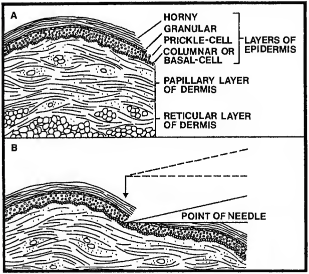

Fig. III (A) Diagrammatic section of the skin of the arm. (B) Same showing the motion of the needle from its first position above and parallel to the skin (indicated by the dotted outline) to its final position pressing against the surface of the skin and entering it slightly.

9. *Scratch technique.* A single linear scratch, not more than a quarter of an inch long, is made through the vaccine with a sterile needle. The needle should not draw blood but the scratch should be deep enough so that slight oozing of serum occurs after a few seconds. The vaccine is rubbed gently into the scratch with the side of the needle.

10. *No dressing* is normally required. If a dressing is thought necessary to protect the lesion or because there is exudation at the site of vaccination it should be of sterile, but not antiseptic, gauze.

Vaccination Procedures

PRIMARY VACCINATION.

11. Vaccination is no longer advised as a routine procedure in childhood. It is indicated only when there is a likelihood of exposure to smallpox. Primary vaccination in adult life may become necessary, e.g. where serving with the armed forces, as a condition of employment and before undertaking foreign travel to certain countries.

12. Recently compiled data indicate that although primary vaccination in adult life carries a small risk of adverse reactions, the incidence of serious complications and death is little different from that observed at the optimum ages during childhood. Therefore routine vaccination in childhood in the hope of reducing risks to adults is not justified. It is hoped that, as a result of the WHO smallpox eradication programme, very few children not now vaccinated will require vaccination in adult life.

13. *Specific contra-indications* (but see paragraph 20). These are:

(a) *failure to thrive in infants;*

(b) *exposure to infectious diseases;*

(c) *a history of or the presence of eczema.* **Eczema is an extremely important contra-indication to vaccination. Primary vaccination should not be performed on any person with eczema or a history of eczema unless there is a risk of exposure to smallpox. Moreover any infant or person with eczema should be kept away for at least 21 days from any recently vaccinated member of the household.** Neglect of this advice may give rise to *eczema vaccinatum* and the risk of death therefrom;

(d) *septic skin conditions*;

(e) *hypogammaglobulinaemia and other immune deficiency states;*

(f) *leukaemia, lymphoma and other reticulo-endothelial malignancies*;

(g) *cortico-steroid and other immuno-suppressive treatment including radiation therapy*;

(h) *pregnancy.*

14. *Number of insertions.* A single site of insertion is sufficient; when the multiple pressure technique is employed the number of pressures should be *up to ten* within an area of skin of not more than one eighth of an inch in diameter.

RE-VACCINATION

15. *Object.* The object of re-vaccination is to maintain or to revive the immunity against smallpox conferred by a previous vaccination or re-vaccination.

16. *Frequency.* The frequency with which re-vaccination should be performed varies with circumstances, e.g.:

(a) *For international travel.* An international certificate of vaccination against smallpox remains valid for three years. Normally re-vaccination should be undertaken every three years for persons who travel regularly to areas where smallpox is still a risk.

(b) *Health service workers*

  (i) *Those of special risk.* Doctors, nurses and others liable to serve on the staff of smallpox hospitals, and any other persons (e.g. ambulance crews ear-marked for smallpox duties) who are likely to have to deal at short notice with smallpox cases or to handle infected material, should be re-vaccinated regularly at yearly intervals, and preferably re-vaccinated when called for smallpox duty.

  (ii) Doctors, nurses, other hospital staff, public health staff and other ambulance personnel should be re-vaccinated at least once every three years.

17. *Number of insertions.* A single site of insertion is sufficient; if the multiple pressure technique is employed *thirty* pressures are advised.

Vaccination in the Presence of Smallpox

18. *Object.* The object in these circumstances is, by primary vaccination or re-vaccination, to enable the individual to acquire resistance to smallpox within the normal incubation period for that disease. The more rapid evolution of vaccinial infection relative to that of smallpox makes this possible in most instances. Vaccination or re-vaccination must be carried out as soon as possible after exposure and at most within three days of exposure. Any delay carries risk to the individual who has been exposed to smallpox. To do this effectively it is probably necessary in a primary vaccination to produce by the eighth day after vaccination a primary Jennerian vesicle or a major reaction; and it is clearly important to be confident that the technique used will produce this result.

19. *Number of insertions.* Two areas of insertion are desirable and they should be placed at least one inch apart. If the multiple pressure technique is used, thirty pressures at each area are necessary; if the scratch technique is preferred, two scratches each at least one quarter inch long are required. Recent work indicates that if a potent vaccine is used, and an effective technique employed, one site of insertion only is necessary.

20. *Contra-indications.* In the presence of suspected smallpox there are no absolute contra-indications to the immediate vaccination or re-vaccination of all close contacts.

21. *Human Anti-Vaccinial Immuno-Globulin.* This should be given into the opposite arm, when vaccinating contacts with any of the following contra-indications:

(a) *Pregnancy;*

(b) *Eczema, or a definite history of eczema;*

(c) *Leukaemia, lymphoma and other reticulo-endothelial malignancies;*

(d) *Hypogammaglobulinaemia and other immune deficiency states;*

(e) *Cortico-steroid and other immuno-suppressive treatment including radiation therapy.*

Human anti-vaccinial immuno-globulin is always in short supply and therefore it is essential that stocks remain centralised at the Epidemiological Research Laboratory, Central Public Health Laboratory, Colindale, London NW9 5HT. Small amounts are also held at Public Health Laboratories in Birmingham, Bristol, Cambridge, Cardiff, Leeds, Liverpool, Manchester, Newcastle, Oxford and Sheffield. Advice as to dosage can be sought from the Directors of these laboratories. In Scotland this material is available from Regional Blood Transfusion Centres.

VACCINATION IN RELATION TO OTHER IMMUNISING PROCEDURES

22. This subject has particular implications for travellers who may have to go abroad at short notice. No hard and fast rules can be laid down and time intervals may have to be reduced or abolished in cases of urgency. When time permits, an interval of at least three weeks should normally be allowed to elapse between the administration of any two live vaccines whichever is given first.

23. There are special considerations to be taken into account with yellow fever vaccine, particularly when it is to be given to infants or when *smallpox vaccine and yellow fever vaccine are to be given to the same person.* If both yellow fever and smallpox vaccination need to be given to the same person it is advisable to allow an interval of at least 3 weeks between the two procedures irrespective of which is given first. If this is not feasible the two vaccinations may be given at the same time but at different sites. This is preferable to shortening the interval between the two procedures because of the possibility of interference between the two vaccines. Wherever possible *infants should not be vaccinated against yellow fever until they are nine months old.*
Exceptionally, infants *under nine months* may have yellow fever vaccination but only at the specific request in writing of the parent or guardian. Where for special reasons an infant under nine months has to be vaccinated against both yellow fever and smallpox there should be an interval of three weeks between the vaccinations, whichever is given first.

INSPECTION OF RESULTS

24. The site of vaccination should be inspected *on or about the seventh day.* The primary vaccination or re-vaccination is considered to be successful if a *major reaction* has occurred.

On inspection after the interval stated above, a "*major reaction*" after primary vaccination is a typical Jennerian vesicle; after re-vaccination a "*major reaction*" is (a) a vesicle or pustule, or (b) an area of definite palpable induration or congestion surrounding a central lesion, which may be a scab or an ulcer.

Any other local reaction is termed an "*equivocal reaction*".

If a "major reaction" has not been obtained one week after the first attempt, the procedure should be repeated with fresh vaccine and the method of storage checked.*

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* Storage of smallpox vaccine: if the liquid vaccine is kept continuously in a deep freeze at a temperature range of minus 10 to minus 18 degrees centigrade its potency can be assured for twelve months from the date of manufacture. When removed from the deep freeze, the vaccine will remain potent for seven days if kept continuously at a temperature not exceeding 10 degrees centigrade.

Dried smallpox vaccine (of which there are reserve stocks in the United Kingdom, but which is not normally issued for use in this country) should retain its potency for at least six months without refrigeration in temperate climates, or for at least one month at tropical temperatures. When opened, this vaccine should be used at once; any surplus should be discarded.

25. *Vaccination after Exposure to Smallpox.* Here a second vaccination is essential if no local reaction is visible on inspection *three* days later.

Recording of Results

26. *Classification.* Results may be classified as follows for reporting purposes:

A — Major reaction.
B — Equivocal reaction.
C — No local reaction.

27. *No local reaction.* The complete absence of local reaction on inspection following primary vaccination or re-vaccination should be regarded in the first place as an indication for at least one further attempt with fresh vaccine with a check on vaccine storage methods and not necessarily as an indication of immunity to smallpox. A similar result on a second such occasion might be recorded as "*no local reaction to repeated vaccination (or re-vaccination)*" and letter C on the report form could be ringed; but this result must not be regarded as indicating immunity to smallpox.

28. Persons intending to travel to countries where smallpox is prevalent who show no vaccination scars and who fail to give a local reaction to vaccination or re-vaccination cannot be presumed to have any immunity to smallpox, and, if time permits, further attempts should be made to obtain a major reaction.

29. *Equivocal reaction.* This has already been defined as any local reaction other than a "major reaction" (see para. 24). After two attempts to obtain a "major reaction" have failed but there has been some local reaction, the result is recorded as "equivocal" and letter B on the report form could be ringed.

30. *Major reaction.* Where there is a "major reaction" the result is so recorded and letter A on the report form could be ringed.

31. *Chronic progressive vaccinia.* In rare instances this condition (also known as *vaccinia gangrenosa* or *vaccinia necrosum*) develops. It should be considered as a possible diagnosis whenever involution of the lesion at the site of vaccination has not begun by the fifteenth day. In this event consultation should be sought with a view to appropriate treatment.

32. *International Requirements.** These are dealt with in a special Notice to Travellers issued jointly by the Department of Health and Social Security, the Scottish Home and Health Department, the Welsh Office and the Central Office of Information.

33. It should be noted that vaccination is not obligatory if a medical contra-indication exists. The following is a quotation from the Official Records of the World Health Organisation 56, 54. "If a vaccinator is of the opinion that vaccination is contra-indicated on medical grounds, he should provide the person with written reasons underlying that opinion, which the health authority of arrival may take into account. Decision on a claim for exemption from the requirement to be in possession of a certificate lies solely with the health authority of arrival."

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* Vaccination and re-vaccination are defined in Annex VII to the International Health Regulations (World Health Organisation 1969) as follows:

Vaccination:	Cutaneous inoculation of smallpox vaccine into a person not previously successfully vaccinated (synonym: primary vaccination).
Re-vaccination:	Cutaneous inoculation of smallpox vaccine into a person who has a vaccination scar or convincing documentary evidence of previously successful vaccination or re-vaccination.

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